



# Woughton Mifflin 6

## Mathematics

### Problem Solving Activities



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# Houghton Mifflin Mathematics 6

## Problem Solving Activities

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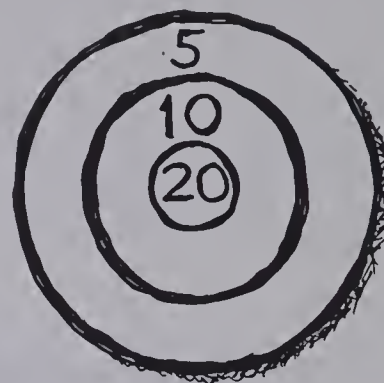
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# UNIT 1 Organizing Information

## Problem:

Rick takes 3 shots at the target and hits it every time.  
How many different total scores are possible?



## Solution:

Make an orderly list of all possible scores.

Scores For Each of Three Shots			Total Score
20	20	20	60
20	20	10	50
20	20	5	45
20	10	10	40
20	10	5	35
20	5	5	30
10	10	10	
10	10	5	25
10	5	5	20
5	5	5	15

There are 9 different scores possible.

Make a list to help you solve the problem.

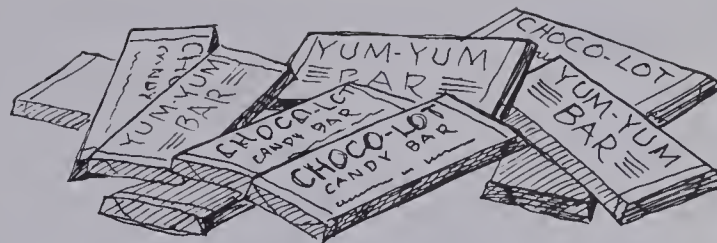
1. Today, Freda's mother is 3 times as old as Freda. Freda was born when her mother was 22. How old is Freda today?

Freda's Age	0	1	2	?	?	?
Mother's Age	22	23	24	?	?	?

2. In a one-child family, there are two possibilities. Either the child is a boy or it is a girl. In a two-child family, there are three possibilities. The children could be 2 boys, 1 boy and 1 girl, or 2 girls. List all the possibilities for a family of 4 children.
3. Jeff needs exactly one dollar's worth of postage stamps to mail a package. Jeff has lots of 10¢ stamps and 15¢ stamps but no other stamps. Show 4 different combinations of stamps that Jeff could put on the package.



4. Darlene bought some 30¢ and some 60¢ candy bars. Altogether she bought 10 candy bars and paid a total of \$4.20. How many candy bars at each price did she buy?



5. With one digit, you can make only one whole number. With two digits, such as 1 and 2, you can make two 2-digit numbers (12 or 21). With the digits 1, 2, and 3 you could make six 3-digit whole numbers. What are all of the different 4-digit whole numbers you can make using the digits 1, 2, 3, and 4? Do not use the same digit twice in any of your numbers.

6. Jill's bug collection contains 12 beetles and spiders. Beetles are worth 10¢ and spiders are worth 20¢. Altogether Jill's collection is worth \$1.70. How many beetles and how many spiders does Jill have?



7. Limericks contain 5 lines and sonnets contain 14 lines. Linda memorized sonnets and limericks with a total of 112 lines. How many sonnets and how many limericks did Linda memorize?

8. Janice has a 5-card hand containing only 7s, 8s, and 9s. The sum of the numbers in her hand is 41. How many 7s, 8s, and 9s does Janice have?



9. Duke and Donna each have 10 coins. All coins are either dimes or quarters. Duke has 5 quarters. Donna has 60¢ more than Duke. How many quarters does Donna have?

**Problem:**

At the First-Rate Bank, there is a service charge of \$1.00 per month and an extra charge of 25¢ for each cheque written. At the Top-Terms Bank, there is a service charge of \$2.00 per month and an extra charge of 10¢ for each cheque written. How many cheques would you have to write so that the rates at the Top-Terms Bank would be better?

**Solution:**

Make a table to compare the rates for writing any number of cheques.

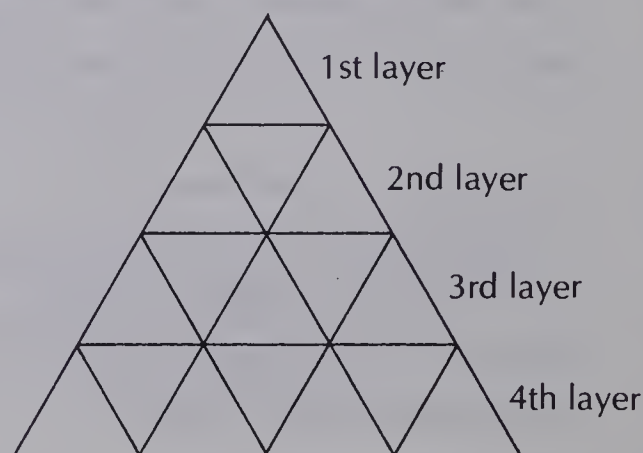
Number of cheques	0	1	2	3	4	5	6	7
First Rate Bank	\$1.00	\$1.25	\$1.50	\$1.75	\$2.00	\$2.25	\$2.50	\$2.75
Top-Terms Bank	\$2.00	\$2.10	\$2.20	\$2.30	\$2.40	\$2.50	\$2.60	\$2.70

The rates are better at Top-Terms Bank when 7 or more cheques are written.

Make a table to help you solve each problem.

1. Nick has \$40.00 and spends \$1.50 each day. Bick has only \$9.00 but he saves \$1.50 each day. In how many days will Bick have more money than Nick?


2. In the large triangle, there is 1 small triangle in the first layer, 3 in the second layer, and 5 small triangles in the third layer. How many small triangles would there be in the tenth layer?

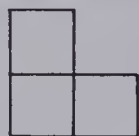


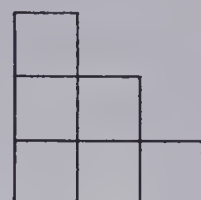
3. Glenna has 2 parents and 4 grandparents. Each of Glenna's grandparents had 2 parents. So, if they were living, Glenna would have 8 great grandparents. If Glenna thinks back *more* generations, how many great, great, great, great grandparents would Glenna have?



4. Suppose we wish to make a stairway using blocks. How many blocks would be needed to make a 10-step stairway?

 1 step  
1 block

 2 steps  
3 blocks

 3 steps  
6 blocks

5. Suppose that tickets for a rock concert cost 5¢ for the first ticket, 10¢ for the second ticket, 15¢ for the third ticket, and so on. If you bought 10 tickets, how much would you pay altogether?
6. One cell divides into 2 cells. Each of those 2 cells divides into 2 more cells for a total of 4 cells. Those 4 cells each divide into 2 more cells. How many cells will there be after the tenth division of cells?
7. A ball is dropped from the CN Tower in Toronto. It falls 5 m in the first second. It speeds up so that it falls 15 m in the *second* second for a total fall of 20 m. It continues to speed up and falls a distance of 10 m more for each second of time than it fell in the previous second. The ball is dropped from a place 500 m high on the tower. How long would it take to reach the ground?



Second of Fall	1st Second	2nd Second	3rd Second	?	?	?
Distance fallen in that second (metres)	5	15	25	?	?	?
Total Distance fallen (metres)	5	20	45	?	?	?

8. Rae starts on a bicycle trip at 8:00 A.M. at the rate of 12 km/h. Two hours later, Myra starts out at the rate of 18 km/h. If both girls maintain their speeds, at what time will Myra catch up to Rae?

# UNIT 2    Guessing and Testing

A problem can often be solved by guessing an answer and testing to see if the guess is a solution.

## Problem:

Sue can't resist donuts. She saw that plain donuts were on sale for 35¢ each and fancy donuts for 50¢ each. Sue bought a dozen donuts and paid \$4.65. How many fancy donuts did she buy?

## Solution:

A table helps to record and check the guesses in an orderly manner.

	1st Guess:	2nd Guess:	3rd Guess:
Plain Donuts	$6 \times \$0.35 = \$2.10$	$8 \times \$0.35 = \$2.80$	$9 \times \$0.35 = \$3.15$
Fancy Donuts	$6 \times \$0.50 = \$3.00$	$4 \times \$0.50 = \$2.00$	$3 \times \$0.50 = \$1.50$
Total	12                  \$5.10	12                  \$4.80	12                  \$4.65

Too much!

Closer!

Just right!

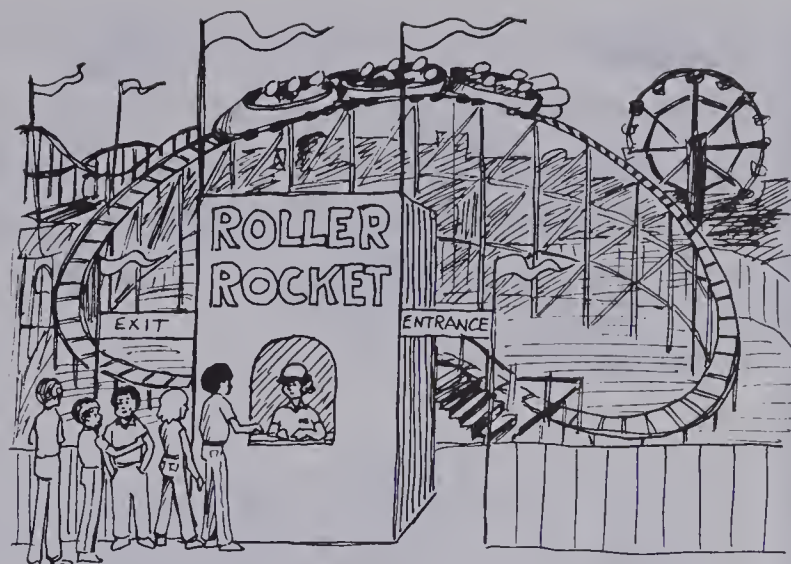
Sue bought 3 fancy donuts.

1. Pancho bought some cans of soup at 39¢ each and a jar of jam at \$1.95. Altogether he spent \$5.07. How many cans of soup did he buy?



2. Sesame snaps cost 30¢ each, and packs of gum cost 25¢. Brenda bought twice as many sesame snaps as packs of gum. Altogether she spent \$4.25. How many sesame snaps did she buy?
3. At the Glamour Boutique, a bottle of Allura Numero 75 perfume costs as much as two bottles of Exotic Mist. Mrs. Hampton bought one bottle of each and paid \$24.00. How much does a bottle of Allura cost?

4. At the Fun-For-All Amusement Park, Gerri went on 8 rides. Some of her rides were on the Roller-Rocket, and the others were on the Terrible Twist. Rides on the Roller-Rocket cost \$0.90 and rides on the Terrible Twist cost \$0.60 each. Altogether Gerri spent \$6.30 on both kinds of rides. How many times did she go on the Roller-Rocket?



5. Apples cost 10¢ each, bananas cost 20¢ each, and peaches cost 30¢ each. Zeke bought eight pieces of fruit and spent \$1.30. How many apples, bananas, and peaches did Zeke buy?
6. Miss Piggy ate 400 more kilograms of hogfood than Mr. Porky. Together they ate a total of 1400 kg of hogfood. Hogfood costs \$2.00/kg. How much did it cost to feed Miss Piggy?
7. Marta has exactly 100 coins, all nickels and dimes. She counted her money and it came to \$8.10. How many of each coin does Marta have?
8. Adult tickets for a movie cost \$4.50 and children's tickets cost \$2.00. There are 120 people at the movie. Ticket sales amounted to \$440.00. How many children attended?
9. At the post office, Slim bought 30¢, 40¢, and 60¢ stamps. He bought the same number of 40¢ stamps as 60¢ stamps. He bought 15 stamps altogether for a total of \$6.90. How many 30¢ stamps did he buy?
10. At Big Burger Barn, 6 children ordered milkshakes and hamburgers. Some had Big Burgers; some had Giant Burgers. There were 9 burgers ordered altogether. Every child had 1 milkshake. The total bill, including milkshakes and burgers, was \$16.80. How many Giant Burgers were ordered?

BIG BURGER BARN	
Big Burger	\$1.20
Giant Burger	\$1.50
Milkshakes	\$0.90



### Problem:

Cora counts calories carefully. One day, when she couldn't resist, she ate 12 candies and cookies. Candies have 300 calories each; cookies have 250 calories each. Cora ate candies and cookies containing 3500 calories. How many cookies did Cora eat?

### Solution:

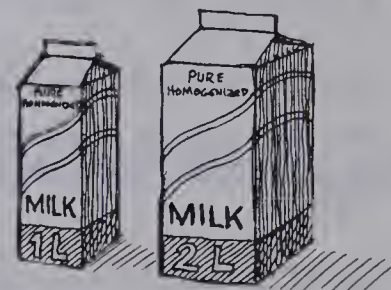
	1st Guess:	2nd Guess:
Candies	$8 \times 300 = 2400$ calories	$10 \times 300 = 3000$ calories
Cookies	$4 \times 250 = 1000$ calories	$2 \times 250 = 500$ calories
Total	12 3400 calories	12 3500 calories

Too few!

Just right!

Cora ate 2 cookies.

1. Mr. Nardi of Dairy Farm Market checked his supply of milk. He counted 120 containers of milk. Some of them were 1 L containers; the rest were 2 L containers. Altogether, there was a total of 190 L of milk in the two kinds of containers. How many were 2 L containers?

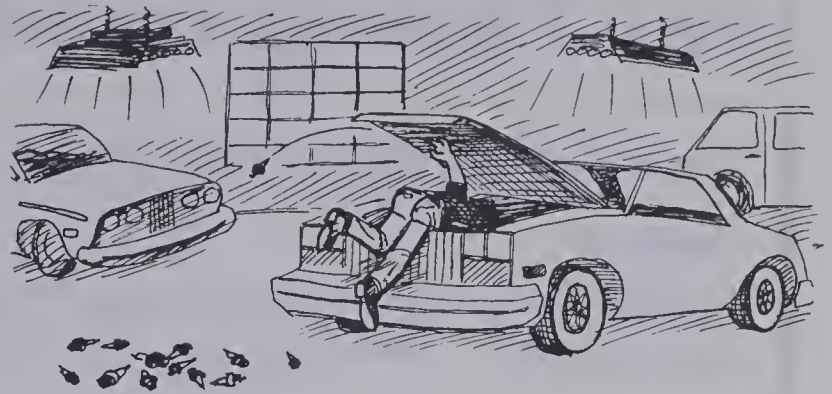


2. Two hundred thirty-five children go to Camp Fir Tree. There are 17 more girls than boys. How many are girls?
3. Joe got 10 more votes than Rita in the school election. Meg got twice as many votes as Joe. Altogether 282 votes were cast. How many votes did the winner get?
4. Arrange the digits 1 to 9 in a square grid so that every column, row, and diagonal has the same sum.





5. Jack's brother, Zack, does engine tune-ups. In one week, he replaced the spark plugs on 22 cars. Each car had either 4 or 6 spark plugs. Zack replaced a total of 116 spark plugs. How many of the cars had 6 spark plugs each?



6. An example of five consecutive numbers is 51, 52, 53, 54, and 55. The sum of five different consecutive numbers is 720. What is the largest number of these five?
7. Vic is half as old as I am. Mick is twice as old as I am. The sum of all of our ages is 49. How old am I?
8. Fly-By-Nite Airways has a fleet of 32 planes. The planes have either 2 engines or 4 engines. Altogether there is a total of 96 engines on all of the planes. How many of the planes have 4 engines?



9. A whole number has two digits. The second digit is two more than the first digit. The sum of the digits is 14. What is the number?
10. The sum of two whole numbers is 100. The difference between these two numbers is 32. What are the two whole numbers?
11. What three different whole numbers give the same result when they are added as when they are multiplied?
12. What two-digit number is equal to three times the product of its digits?

# UNIT 3 Looking For Patterns

Once an orderly list of numbers is made, it is easier to look for a pattern.

## Problem:

Multiply the number 4 by itself again and again.

What happens to the ones-place digit in the product?

## Solution:

List all the products using 4s. Look for the pattern.

$$4 = 4$$

$$4 \times 4 = 16$$

$$4 \times 4 \times 4 = 64$$

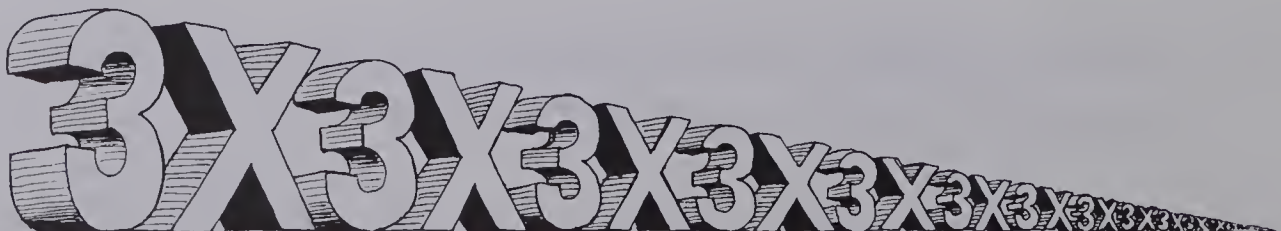
$$4 \times 4 \times 4 \times 4 = 256$$

$$4 \times 4 \times 4 \times 4 \times 4 = 1024$$

For an *even* number of 4s, the product has a **6** in the ones place. For an *odd* number of 4s, the product has a **4** in the ones place.

Find a pattern.

1. Double the number 3. Now double that number. Keep doubling until you find a pattern for the digits in the ones place. What is the pattern?
2. What pattern results in the ones-place digits of the products if we multiply the number 6 by itself over and over again?
3. Find patterns for the ones-place digits of the products when we multiply each of the following numbers by themselves over and over again:
  - a. 3
  - b. 7
  - c. 9



4. Add 6 to itself over and over again. What is the pattern in the ones-place digits of the sums?
5. Study the patterns in the list of products below. What are the missing products?

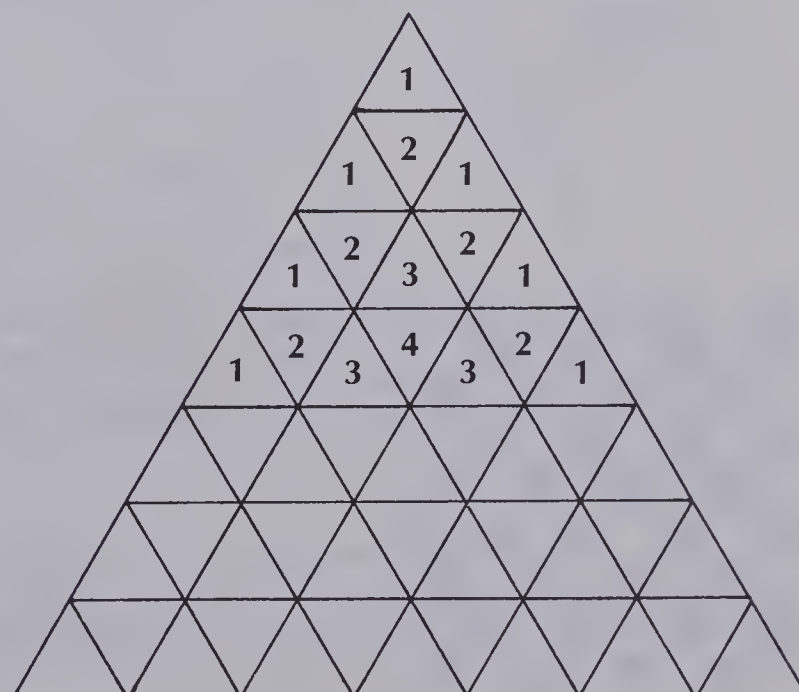
$11 \times 99 = 1089$	$55 \times 99 = ?$
$22 \times 99 = 2178$	$66 \times 99 = ?$
$33 \times 99 = 3267$	$77 \times 99 = ?$
$44 \times 99 = 4356$	$88 \times 99 = ?$
	$99 \times 99 = ?$

6. Choose any 3-digit number and multiply it by 1001. Pick another 3-digit number and multiply by 1001. Look for number patterns. Predict the products if you multiply 345 and 627 by 1001.
7. Study the dot patterns. How many dots would there be in all if there were 10 rows of dots?



Look at the triangular array at the right.

8. What is the middle number in the 9th row? 20th row?
9. How many numbers will be in the 9th row? 20th row?
10. What is the sum of the numbers in the 9th row? 20th row?



### Problem:

At the Double-Dip Ice Cream Palace there are 5 flavours of ice cream. How many different double dips are possible? (Count two dips of the same flavour as one of the different double dips.)

### Solution:

Make a table and then look for a continuing pattern to solve the problem.

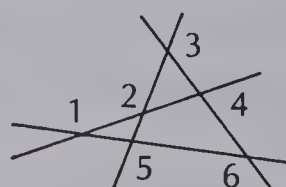
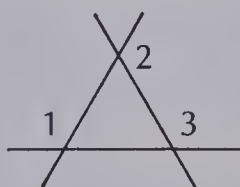
Number of	
Flavours	Double Dips
1	1
2	3
3	6
4	10
5	15

+2 AA  
 +3 AA BB AB  
 +4 AA BB CC AB AC BC  
 +5 AA BB CC DD AB AC AD BC BD CD  
 AA BB CC DD EE AB AC AD AE BC  
 BD BE CD CE DE

Fifteen double dips are possible.

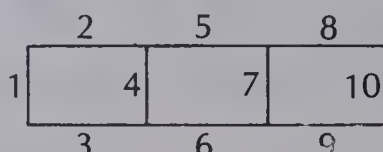
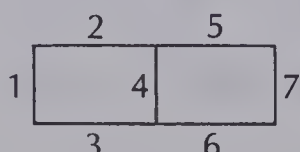
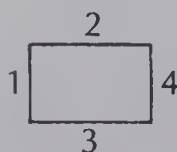
Use the pattern to solve the problem.

- The greatest number of points at which 2 lines can meet is 1. The greatest number of points at which 3 lines can meet is 3. What is the greatest number of points at which 6 lines could meet? (Illustrate your answer.)



Lines	Points
1	0
2	1
3	3

- One rectangle has 4 sides. If you arrange 2 rectangles together, you will see 7 sides. Join a third rectangle to the first two, and you will see 10 sides. How many sides would you see if you joined 12 rectangles together?



Rectangles	Sides Seen
1	4
2	7
3	10



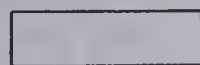
3. With the digits 1 and 2, you can form exactly two different 2-digit numbers with no repetitions: 12 and 21. With the digits 1, 2, and 3, you can form exactly six different 2-digit numbers: 12, 13, 23, 21, 31, and 32. How many different 2-digit numbers can you form with the digits 1, 2, 3, and 4? How many different 2-digit numbers can be formed with the digits 1, 2, 3, 4, 5, and 6?

Numbers of digits	1	2	3	4	⚡
Different numbers	1	2	6		⚡

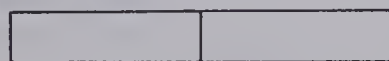
4. One straight cut will divide a pie into 2 pieces. The greatest number of pieces from 2 straight cuts is 4. The greatest number of pieces from 3 straight cuts is 7. What is the greatest number of pieces that will result from 6 straight cuts?



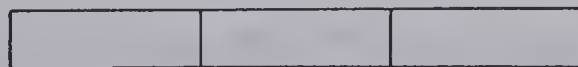
5. When 2 rectangles are joined together, you can see 1 large rectangle and 2 smaller ones. When 3 rectangles are joined together, you can see 1 large rectangle, 2 smaller ones (each made up of 2 little rectangles), and 3 little rectangles. How many different-sized rectangles would there be if you arranged 8 rectangles in one long row?



1 rectangle

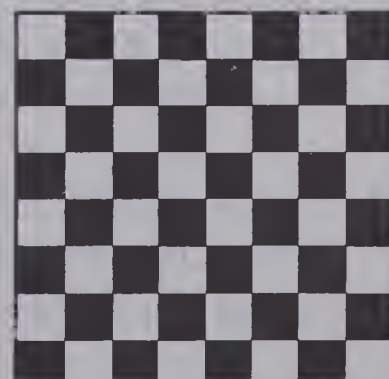


3 rectangles



6 rectangles

6. On an 8 by 8 checkerboard, the largest rectangle which you have is the whole board, 8 by 8. The smallest rectangle which you could have is 1 by 1. How many different-sized rectangles are there on a checkerboard? (Assume a 5 by 3 rectangle to be the same as a 3 by 5 rectangle.)



# UNIT 4 Too Many and Too Few Facts

Often there are more facts given in a problem than are needed to solve it.

## Problem:

Tickets for the circus cost \$6.00 for adults and \$3.50 for children. On opening day 6000 people attended the circus. Of these people, 4500 were children. Mr. and Mrs. Stone went to the circus on opening day with their 3 children. How much did the tickets cost Mr. Stone?

## Solution:

Use only the facts needed to solve the problem.

$$\text{Cost for 2 adults: } 2 \times \$6.00 = \$12.00$$

$$\text{Cost for 3 children: } 3 \times \$3.50 = \$10.50$$

$$\text{Total cost: } \underline{\hspace{1cm}} \$22.50$$

Extra facts: 6000 people, 4500 children

The tickets cost Mr. Stone \$22.50.

1. While grocery shopping, Mrs. Olsen found 375 g and 525 g boxes of corn flakes. She also saw 400 g and 600 g boxes of bran cereal. Mrs. Olsen decided to buy a large box of corn flakes and the small box of bran flakes. How much more or less than a kilogram of cereal did Mrs. Olsen buy?
2. Mr. Burns drove from his home to the lake at the speed of 90 km/h. He left at 8 o'clock in the morning and drove the distance of 225 km. How long did it take Mr. Burns to drive the distance to the lake?
3. In one season, the Edmonton Eskimos scored 315 points. They won the Grey Cup game by 3 points. There were 79 points scored in the game. What was the score of the game?

4. About how many times would the area of the smallest Great Lake fit into the area of the largest Great Lake?

5. How much less area is covered by Lake Michigan than Lake Superior?

6. The Great Slave Lake of the Northwest Territories has an area of 29 000 km<sup>2</sup>. Which of the Great Lakes have smaller areas than Great Slave Lake?



Lake	Area (km <sup>2</sup> )
Superior	82 000
Huron	60 000
Michigan	58 000
Erie	26 000
Ontario	20 000



orange chocolate sandwich <b>Biscuits</b> 150 g pkg. <b>.99</b>	from the tropics <b>large size bananas</b> kg <b>.73</b>	product of South Africa <b>lemons</b> 5/ <b>.99</b>
<b>Iced Tea Mix</b> 680 g tin <b>2.99</b>	Canada no. 1 grade <b>cantaloupes</b> each <b>.99</b>	<b>Peanut Butter</b> 750 g jar <b>3.69</b>

7. Mr. Elliot bought 2 kg of bananas, 3 cantaloupes, and 1 jar of peanut butter. He gave the clerk a ten-dollar bill. What was his change?

8. Mrs. Piper bought one of every item which did not have to be weighed. How much did Mrs. Piper spend? Round each price up to the nearest cent.

9. What is the cost of half a kilogram of bananas and 2 packages of biscuits? Round up to the nearest cent.



**Sometimes not enough facts are given to solve a problem.**

**Problem:**

Sheila gets an allowance of \$3/week and she earns extra money by baby-sitting. She wants to buy a camera which costs \$49.95. She has already saved \$22.75 for the camera. If she saves all her money each week, how many weeks will it be before she has enough to buy the camera?

Money still needed:  $\$49.95 - \$22.75 = \$27.20$

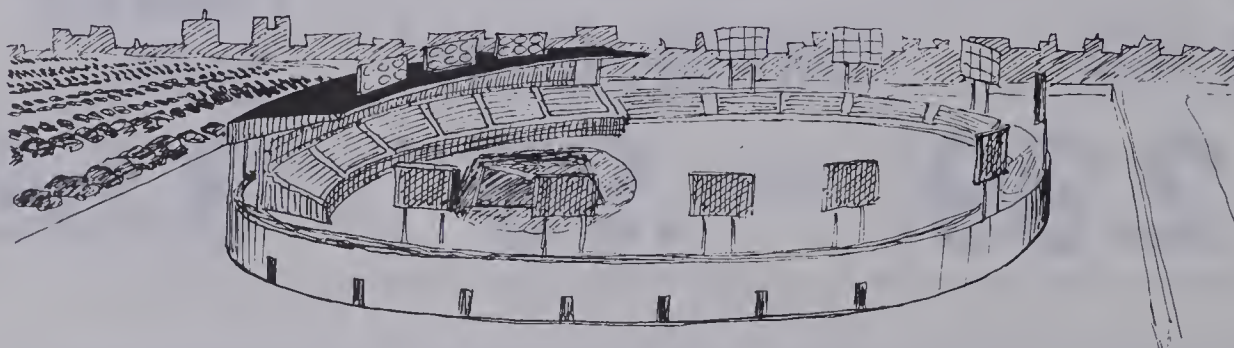
Ways Sheila earns money:

1. \$3/week allowance
2. baby-sitting

Missing fact: How much does Sheila earn by baby-sitting?

If the problem cannot be solved, write which facts are missing.

1. At a major league baseball game, 11 463 fans bought tickets that cost \$7.50. There were 13 512 tickets sold at \$5.50 each. The rest of the fans bought general admission tickets at \$2.50 each. How much money was taken in from ticket sales?



2. How much longer is the Mackenzie River than the Fraser River?
3. How much longer is the Nile River than the Mackenzie River?
4. Is the Mackenzie River the longest river in North America?

River	Length
Fraser	1200 km
Mackenzie	4100 km
Ottawa	1100 km
Saguenay	650 km
St. Lawrence	1200 km
Yukon	3700 km

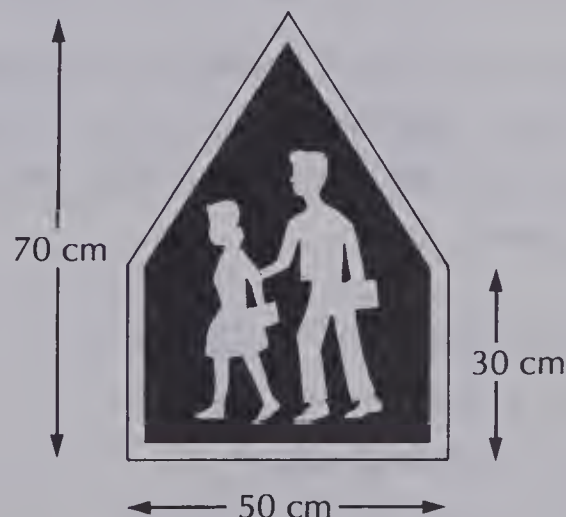


5. At 7 o'clock in the morning, the Martels started their trip to their summer cottage which was 450 km away. Mr. Martel stopped 10 min to fill his tank with 52 L of gas. Later they stopped 50 min for lunch. The speed limit on expressways is 100 km/h. For how long did the Martels stop during their trip?

6. Great Slave Lake in the Northwest Territories has an area of 29 000 km<sup>2</sup>. Nipigon Lake in Ontario has an area of 4100 km<sup>2</sup>. The average depth of Great Slave Lake is 198 m. How much deeper is Great Slave Lake than Nipigon Lake?

7. A popular magazine sells for \$1.75 at the newsstands. The publishers have a special subscription rate of \$0.94 per issue for 26 weeks, or \$0.89 per issue for 52 weeks, or \$0.85 per issue for a 2-year subscription. How much will Mr. Perkins save if he takes out a subscription for the magazine?

8. Motorists are warned about school zones with signs like the figure shown. What is the perimeter of the sign?



9. When Chris takes a bath, he uses about 150 L of water. When he takes a shower, he uses about 8 L/min. How much water does Chris save when he takes a shower instead of a bath?

10. Mr. and Mrs. Hoyt are trying to decide on a new rug for their living room which is 6 m long and 5 m wide. They like a brown rug at \$17.95/m<sup>2</sup>, a beige rug at \$19.95/m<sup>2</sup>, and a flower print rug at \$24.95/m<sup>2</sup>. How much would they spend if they bought the beige rug?

# UNIT 5 Using Diagrams

A diagram can be used to understand and solve a problem.

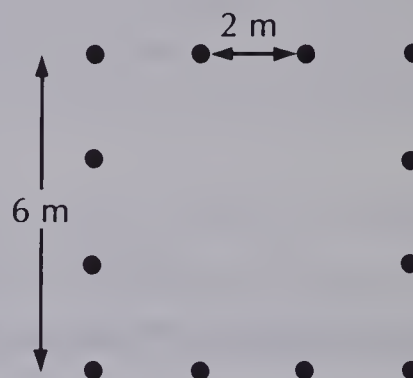
**Problem:**

Mr. Hart wants to fence in a square garden that is 6 m on each side. He wants to place the fence posts 2 m apart. How many posts will he need?

**Solution:**

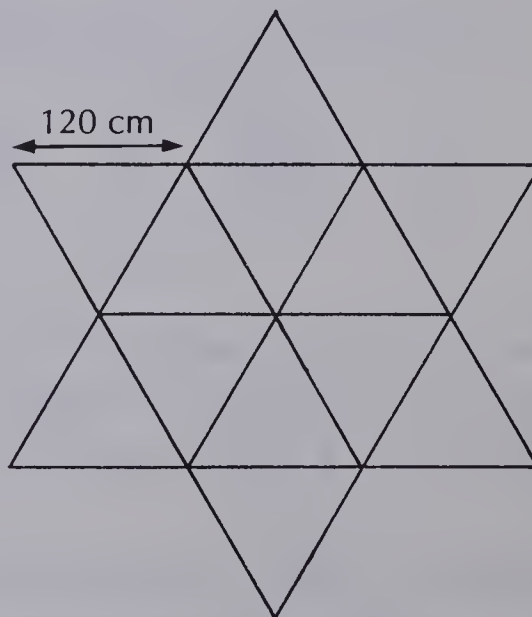
The diagram of the garden shows the posts as 2 m apart. There are 4 posts on each side, but only  $(4 \times 4) - 4$  or 12 posts in all.

We subtract 4 because each corner post is on 2 sides.

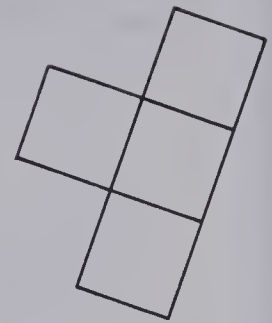
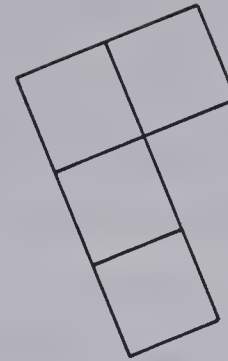


Use a diagram to help you solve the problem.

1. Mrs. Quinn has a rose garden in the shape of a triangle. Each side of the triangle has a length of 8 m. On each side of the garden, a rose bush has been planted every half metre. How many rose bushes are on the sides of the garden?
2. One of the gardens in a park has the shape at the right with a differently coloured flower planted in each section. At every point where two or more lines meet, there is an automatic sprinkler valve. How many valves are there in the garden?
3. A rabbit eats his way completely around the edge of the garden. If a side of each star point is 120 cm long, how far does the rabbit travel?

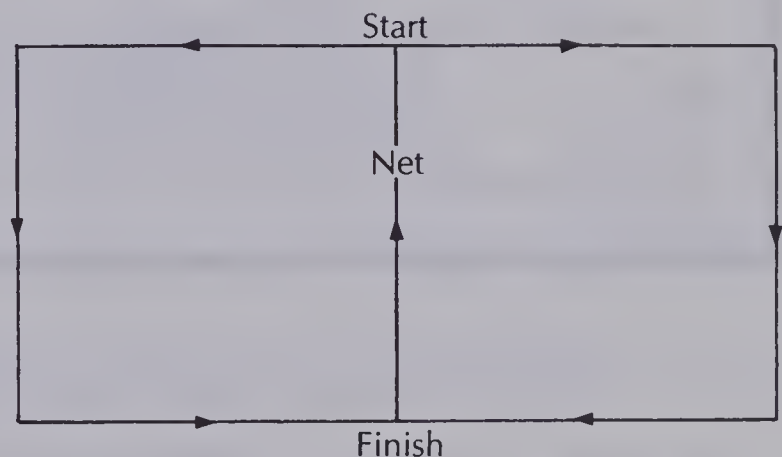


4. Four square tiles can be put together to form various figures. Two of those figures are shown at the right. Draw the three other figures that can be made with four square tiles. Any two tiles must have at least one edge in common.

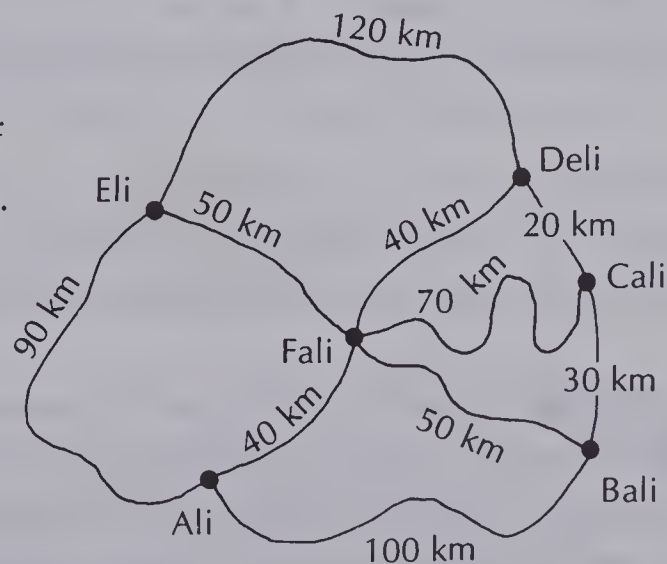


5. Suppose the tiles in the previous problem have sides measuring 2.5 cm. Which of the five figures made with four tiles has the smallest perimeter?
6. The wall of a living room is 5 m long and 3 m high. The wall has a large picture window 3 m long and 2 m high. How many square metres of wallpaper would cover the wall?

7. An ant travels around the edge of a ping pong table and goes under the net without retracing any steps. One possible path is shown in the diagram. How far does the ant travel if the table is 304 cm long and 137 cm wide?



8. Country roads connect 6 towns. You want to visit all the towns starting from Ali. Find the path of the shortest distance that does so.

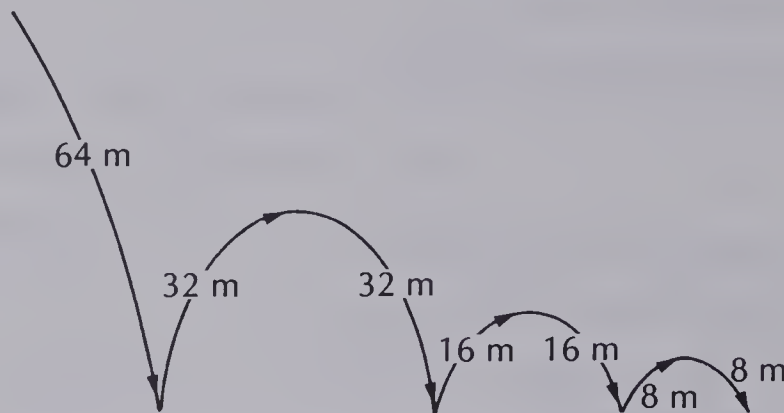


**Problem:**

A ball is dropped from a height of 64 m. It bounces upward 32 m, and each time it returns upward it goes half as high as on the previous bounce. How far does the ball travel after it has touched the ground four times?

**Solution:**

Draw a diagram to picture the ball's upward and downward path.



The distance of 64 m is covered only once. The succeeding distances are covered twice, once on the way up and once on the way down.

$$64 + 32 + 32 + 16 + 16 + 8 + 8 = 176$$

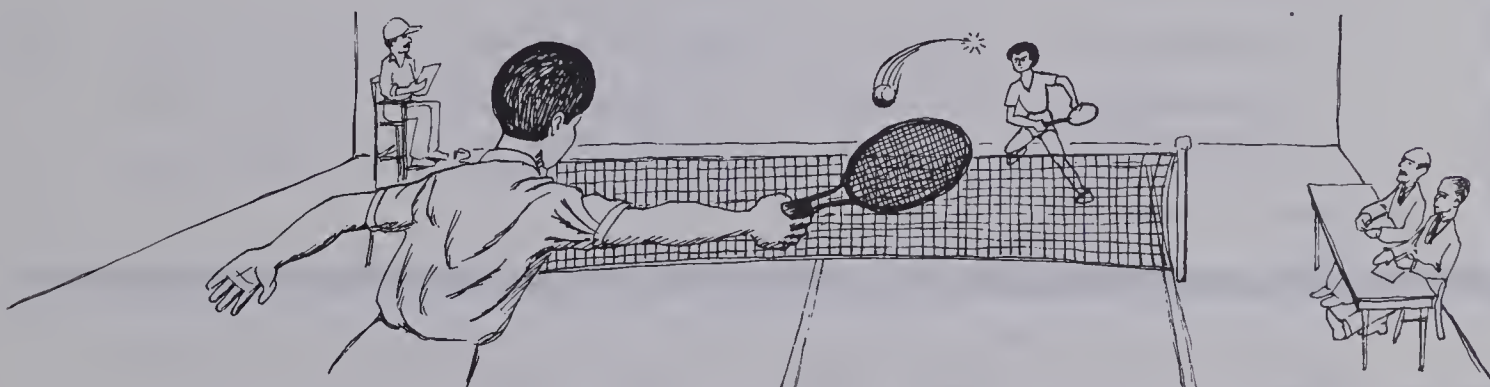
The total distance travelled by the ball is 176 m.

Draw a diagram to help you solve the problem.

1. Blackstone is 100 km from Kingston. Wheelhouse is midway between Blackstone and Kingston. A tunnel, on the same road as the three towns, is 30 km from Kingston. How far is the tunnel from Wheelhouse?
2. The centre section of a recreation hall is to be tiled. The hall is 20 m long and 12 m wide. The area to be tiled is 15 m by 8 m. What is the area of the part of the floor which will *not* be tiled?
3. Sara trades in her animals for smaller animals always getting 3 new animals for each animal she trades in. She traded in her horse for 3 cows, each cow for 3 pigs, and each pig for 3 goats. If Sara traded the goats for lambs and the lambs for ducks, how many ducks did she finish up with?



4. From Sturbridge to Dilburg, there are 3 roads. From Dilburg to Briarpatch, there are 4 roads; and from Briarpatch to Coaltown, there are 2 roads. If you plan a trip from Sturbridge to Coaltown, how many different routes could you take?
5. A grocer makes a display of cans of peaches by stacking them so that there is 1 can on top, 2 cans in the second row from the top, 3 cans in the next row, and so on until he has 20 rows of cans. How many cans of peaches will there be in the stack altogether?
6. In a single elimination tennis tournament, Irene beat Steve, but lost to Ian. Joe beat Ann, but lost to Beth. Dina lost to Ian. Beth beat Ted and Joe, but lost to Ian. Who won the tournament?



7. Seventeen students ordered hot dogs and fries. Eleven students ordered fries. Twelve ordered hot dogs. Six students ordered both fries and hot dogs. How many students ordered only hot dogs?
8. Of the 20 cars in the school parking lot, 4 are silver and have 2 doors; 18 have 2 doors; and 6 are silver. How many cars are silver but do not have 2 doors?
9. In a single elimination basketball championship, the Bears lost to the Badgers who beat the Beavers. The Bisons lost to the Beavers. Which team won the championship?



# UNIT 6 Using Equations

Equations help you guess and test possible solutions to a problem.

**Problem:**

If 6 bananas cost 90¢, what does one banana cost?

**Solution:**

- (1) Let the cost of a banana be represented by  $B$ .
- (2) Write an equation:  $6 \times B = 90$ .
- (3) Guess and test what the unknown is.

1st guess:

One banana costs 12¢.

$$6 \times B = 90$$

$$6 \times 12 = 72$$

Too small!

One banana costs 15¢.

2nd guess:

One banana costs 15¢.

$$6 \times B = 90$$

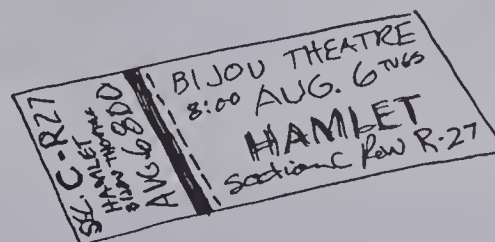
$$6 \times 15 = 90$$

Just right!

Choose a letter to represent what is unknown. Then write an equation and guess and test the solution.

1. If 3 footballs cost \$51.00, what does one football cost?
2. Zeke needs 34 more baseball cards to bring his collection up to 200. How many baseball cards does he have now?
3. Mike stood on a scale and saw that he had a mass of 52 kg. Then Ross got on the scale and the two boys together saw a reading of 99 kg. What is Ross's mass?
4. The Hootons covered their entire living room floor with a new rug. The rug cost \$18.00/m and the Hootons paid a total of \$360.00 for the rug. What is the area of their living room?

5. Lisa went to the movies with a ten-dollar bill and came home with \$4.78. How much did she spend?
6. On a tennis tour, Chris Evert Lloyd played 108 games and won 83 of them. How many games did she lose?
7. Angie played the video game Pac-Man for 5 min. After 1 min, Pac-Man had eaten 48 video dots. When Angie was finished, Pac-Man had eaten a total of 263 dots. How many dots were eaten by Pac-Man in the last 4 min?
8. After doing the dinner dishes, Sparky said, "I must have washed a million dishes!" Actually, there was a total of 137 dishes. How many more dishes would Sparky have to wash to bring his total to a million?
9. In Glenda's book, there are about 300 words on each page. There are about 9 words on a line. About how many lines are there on a page?
10. Ursula bought a sheet containing 25 postage stamps. The cost of the sheet was \$8.75. What was the price of each stamp?
11. Alex can run from his home to the park and back in 22 min. His older brother can run the same distance in 17 min. By how many minutes would Alex have to improve his running time to equal that of his brother?
12. Mr. Naber bought 5 theatre tickets for \$42.50. What was the price per ticket?
13. The Earlyville Eagles played 120 softball games last season and lost 53 of them. How many games did they win?



Sometimes two equations are used to help you guess and test possible solutions to a problem.

**Problem:**

If you add Maria's age to her father's age, you get 36.

If you subtract Maria's age from her father's age, you get 20. What are the ages of Maria and her father?

**Solution:**

- (1) Let Maria's age be  $M$ . Let her father's age be  $F$ .
- (2) Write two equations:  $F + M = 36$  and  $F - M = 20$ .
- (3) Guess and test to find the 2 unknowns.

1st guess:

Maria is 9.

Her father is 27.

$$F + M = 36$$

$$27 + 9 = 36$$

$$F - M = 20$$

$$27 - 9 = 18$$

Not quite!

2nd guess:

Maria is 8.

Her father is 28.

$$F + M = 36$$

$$28 + 8 = 36$$

$$F - M = 20$$

$$28 - 8 = 20$$

Just right!

Write two equations. Then guess and test the solution.

1. If you add two numbers, the sum is 15. If you multiply the two numbers, the product is 56. What are the numbers?
2. A chicken and an egg cost \$2.00. The chicken costs \$1.60 more than the egg. What is the cost of the chicken?
3. In the baseball game between the Toads and the Frogs, there were 46 runs scored. The Toads scored 8 more runs than the Frogs. What was the score of the game?



4. A dress and a hat cost \$40.00. The dress cost \$6.00 more than the hat. What was the cost of the hat?
5. When Paul added his height to his father's height, he got 352 cm. When Paul subtracted his height from his father's height, he got 18 cm. What is Paul's height?
6. At the rock concert, there were 8400 people. There were 600 more females than males. How many females were at the concert?
7. Together Timmy and Eddie have a mass of 93 kg. Timmy's mass is 15 kg more than Eddie. What is each boy's mass?

8. A champion golfer had an 18-hole score of 68. He took 6 strokes less on the back 9 holes than on the front 9 holes. How much did he score on the front 9 holes and the back 9 holes?



9. A rectangle has a perimeter of 26 cm and an area of  $40 \text{ cm}^2$ . What are the length and width of the rectangle?
10. In a field, the number of pigs and geese is 20. The number of legs is 70. How many pigs and how many geese are in the field?
11. Together, the two cars in the Healy family have been driven for 84 000 km. Their older car has been driven for 20 000 km more than their newer car. For how many kilometres has each car been driven?

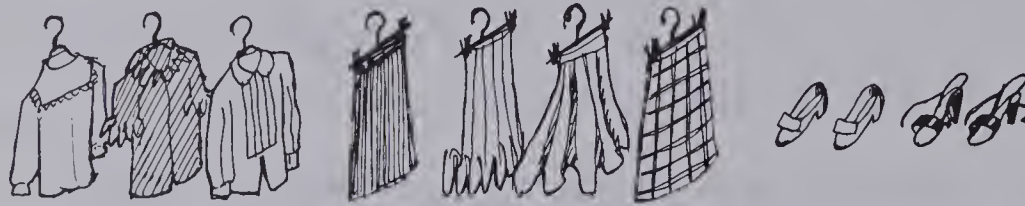
12. Tom and Anna each keep guppies in their aquariums. In all, they both have 65 guppies. Tom has 9 fewer than Anna. How many guppies does Tom have?



# UNIT 7    Review Problems

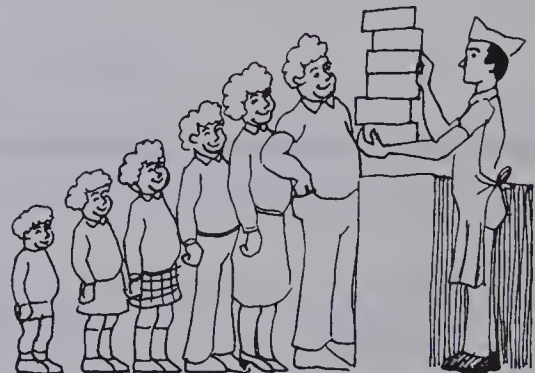
Solve each problem using strategies you have already practised.

1. Meg has a choice of 3 blouses, 4 skirts, and 2 pairs of shoes as she plans her outfit for a school dance. How many different outfits are possible?



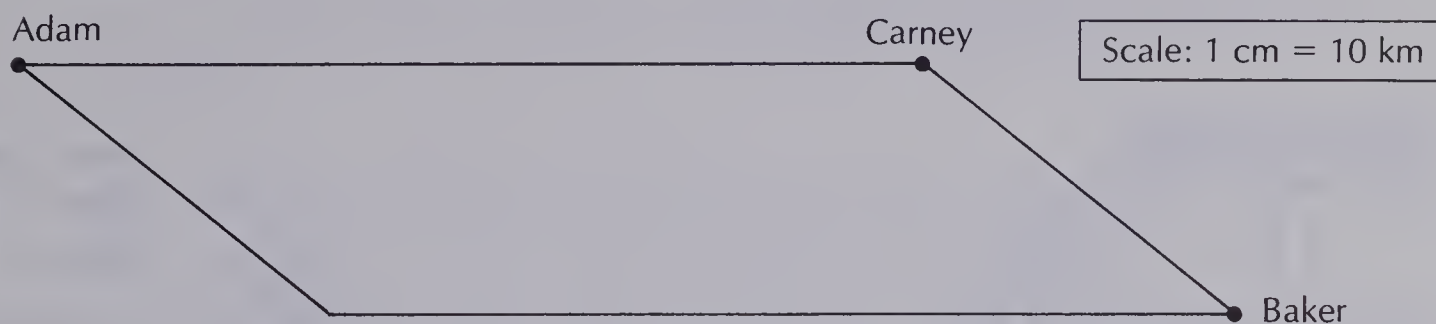
2. Zelda bought 5 tickets for a hockey game. The tickets were numbered in order. Zelda added the numbers and got 4165. What were the ticket numbers?
3. In Apple Blossom School, there are 18 times as many students as there are adults. Altogether there are 399 persons at the school. How many students are at Apple Blossom School?

4. At the Fish-Fry Shop, one take-out fish dinner costs \$4.50. If a second dinner is bought, it costs \$4.00. For each additional take-out dinner, the price is reduced by 50¢. If the Hurst family buys 6 take-out dinners, what will be the cost?



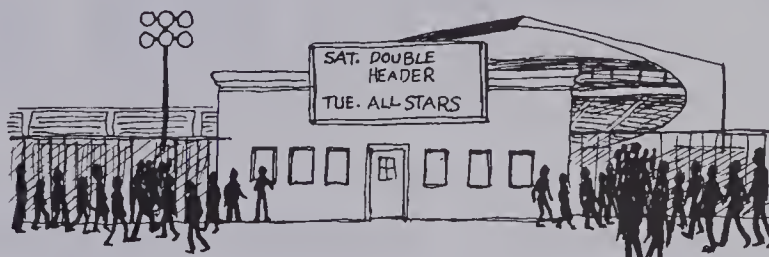
5. How many dinners from the Fish-Fry Shop would have to be ordered before you could get a free dinner?
6. Suppose that if tickets for a concert are bought 8 weeks in advance, they cost \$5.00 each; 7 weeks in advance, \$10 each; 6 weeks in advance, \$15 each; and so on. How much would a ticket cost if it were bought on the night of the concert?

7. The map below shows the roads joining three towns. Every centimetre on the map represents 10 km. What is the actual distance from Adam to Baker to Carney and back to Adam?



8. At noon, the ball park was empty. At 12:01, there were 10 people in the park; at 12:02, 20 people; at 12:04, 80 people; and so on. If this pattern continues, how many people will be in the park at 12:10?

9. If there are 40 000 seats in the ballpark, at what time will the park be full?



10. Mr. Watkins earns \$12.00/h for 40 h/week. If he works more than 40 h, Mr. Watkins gets time and a half or \$18.00/h. How much does Mr. Watkins earn in one week?

#### Sales and Profits of Canada's Three Largest Grain Cooperatives for One Year

Name of Cooperative	Sales	Profits
Saskatchewan Wheat	\$1 941 433 000	\$72 744
Alberta Wheat	\$1 390 978 000	\$34 592
United Grain	\$1 374 576 000	\$ 7 603

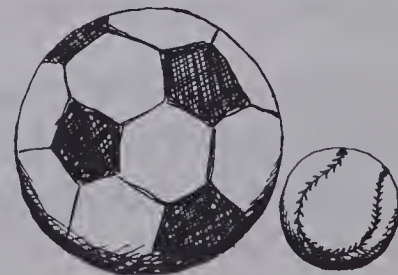
11. How much greater were the sales of Alberta Wheat than United Grain?
12. If profits remained about the same every year, about how many years would it take United Grain to have about the same profit that Saskatchewan Wheat makes in one year?
13. How many persons are employed by Saskatchewan Wheat?



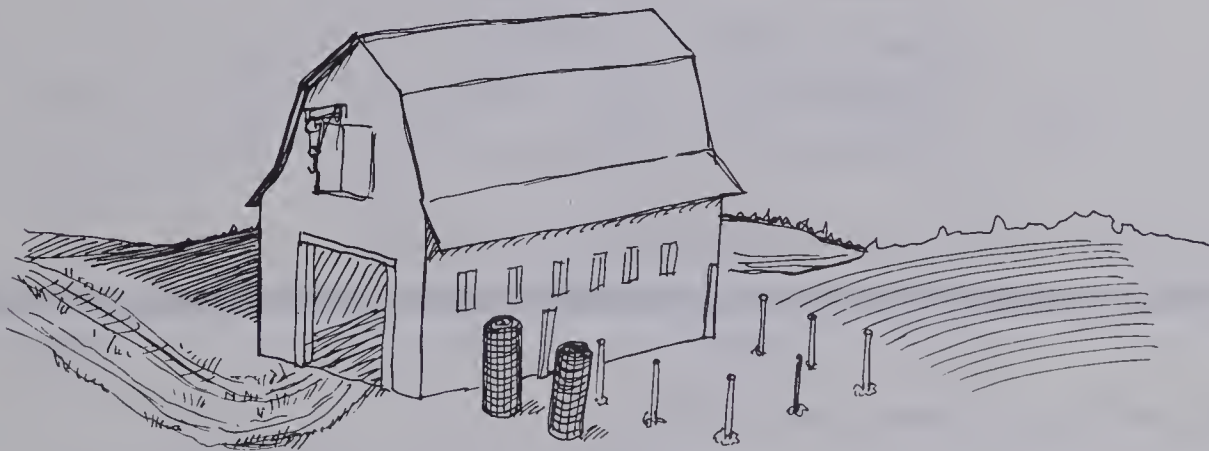
14. Mrs. Paquette drove 60 km to a meeting which lasted for 2 h and 30 min. Then she had a lunch break for  $1\frac{1}{2}$  hours. The lunch bill for 6 women amounted to \$38.52. If the women divided the cost equally, how much did Mrs. Paquette pay?



15. In the first two weeks of its showing, *Superman II* took in \$42 500 000 in ticket sales. It was shown in 1408 theatres. *E.T.* was shown in 1116 theatres during its first two weeks and took in \$44 800 000. How much more money was taken in by *E.T.*?
16. What is the fewest number of coins you can have that will pay the exact price for any amount from 1¢ to 20¢?
17. The perimeter of a photograph is 36 cm. The length is twice as long as the width. What are the length and the width of the photograph?
18. Mr. Tompkins, a physical education instructor, bought 4 soccer balls and 5 baseballs for the school. The total cost was \$60.00. A soccer ball costs \$6.00 more than a baseball. What is the price of a baseball and a soccer ball?



19. How many different rectangles with dimensions in whole numbers have a perimeter of 24?
20. Of all the rectangles with a perimeter of 24, which rectangle has the greatest area?
21. Myra's book on space adventures has 85 pages. Some pages have printing only and the rest have both printing and pictures. There are about 200 words on a printed page and about 50 words on a pictured page. The book has about 11 000 words in all. How many of the pages have pictures?
22. A farmer wishes to put up a fence to make a rectangular pig pen. One side of the pen will be his barn, so the farmer needs fencing on only three sides. He has 100 m of fencing and would like to make the pig pen with as large an area as possible. What should the dimensions of the pig pen be?



23. The combined populations of Mayville and Branby is 5200 people. Branby has 800 more people than Mayville. How many people live in Mayville?
24. The sum of three consecutive numbers is 276. What are the three numbers?
25. Multiply the number, 11, by the numbers from 10 to 25. Study the products. What pattern do you notice?

# UNIT 8    Organized Lists

Some problems can be solved more easily when facts are organized in a list.

**Problem:**

The average annual rainfall for some cities in Canada was found to be: Charlottetown, 99.1 cm; Edmonton, 43.5 cm; Fredericton, 108.7 cm; Medicine Hat, 32.9 cm; Toronto, 81.7 cm; Vancouver, 149.0 cm; Winnipeg, 52.3 cm. Which parts of Canada appear to have the most rainfall?

**Solution:**

Make a list of the amounts of rainfall in increasing order.

<i>City</i>	<i>Rain</i>
Medicine Hat	32.9 cm
Edmonton	43.5 cm
Winnipeg	52.3 cm
Toronto	81.7 cm
Charlottetown	99.1 cm
Fredericton	108.7 cm
Vancouver	149.0 cm

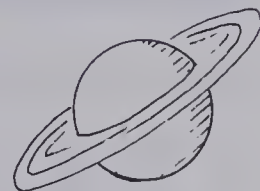
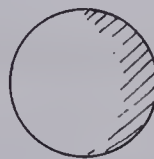
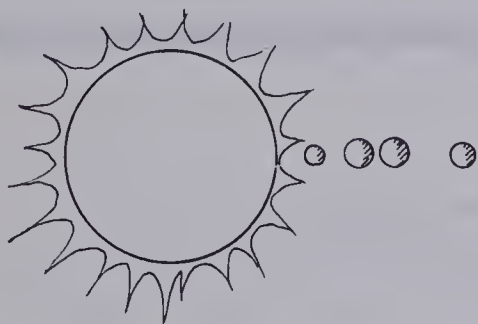
The coastal regions of Canada have the most rainfall.

Make a list to help you answer the questions.

1. The greatest depths of some of the world's largest seas are the Caribbean Sea, 7540 m; the Mediterranean Sea, 5153 m; the Sea of Okhotsk, 3376 m; Hudson Bay, 258 m; North Sea, 671 m; Black Sea, 2246 m; Red Sea, 2196 m. Are the following statements true or false?
  - a. The deepest part of Hudson Bay is about one tenth the deepest part of the Caribbean Sea.
  - b. The deepest part of the Black Sea is about 100 m deeper than the deepest part of the Red Sea.
  - c. The deepest part of the Mediterranean Sea is over 5 km deep.



2. The greatest life span of some animals are the giant tortoise, 190 years; the elephant, 84 years; the eagle, 55 years; the gorilla, 33 years; the tiger 25 years; the rattlesnake, 20 years; and the pig, 10 years.
  - a. Is the greatest life span of an elephant more or less than half the greatest life span of a giant tortoise?
  - b. The greatest life span of which animal is twice as much as that of the pig?
  - c. Do the larger, heavier animals have the greatest life spans?
  - d. About how many generations of gorillas could occur in 100 years?



3.

Six Planets Nearest the Sun			
Planet	Distance From Sun (Earth = 1 unit)	Time To Go Around Sun	Diameter (Earth = 1 unit)
Mercury	0.39	88.0 days	0.38
Venus	0.72	224.7 days	0.82
Earth	1.00	365.2 days	1.00
Mars	1.52	1.9 years	0.53
Jupiter	5.20	11.9 years	11.20
Saturn	9.54	29.5 years	9.36

Are the following statements true or false?

- a. The farther away from the sun, the longer it takes to go around the sun.
- b. The farther away from the sun, the bigger the planet.
- c. In the time it takes the earth to go around the sun, Mercury circles the sun about four times.
- d. It takes Jupiter about six times as long to circle the sun as it takes Mars.
- e. The diameter of Mars is about half the diameter of Earth, and it takes Mars about half as long to circle the Sun as it takes the Earth.

**Problem:**

A bell rings every 2 min, a horn blows every 3 min, and a rooster crows every 4 min. At noon they all sound off together. In how many minutes will all three sound off together again?

**Solution:**

List the times when all three sounds are made.

**Bell** 12:02 12:04 12:06 12:08 12:10 12:12 12:14

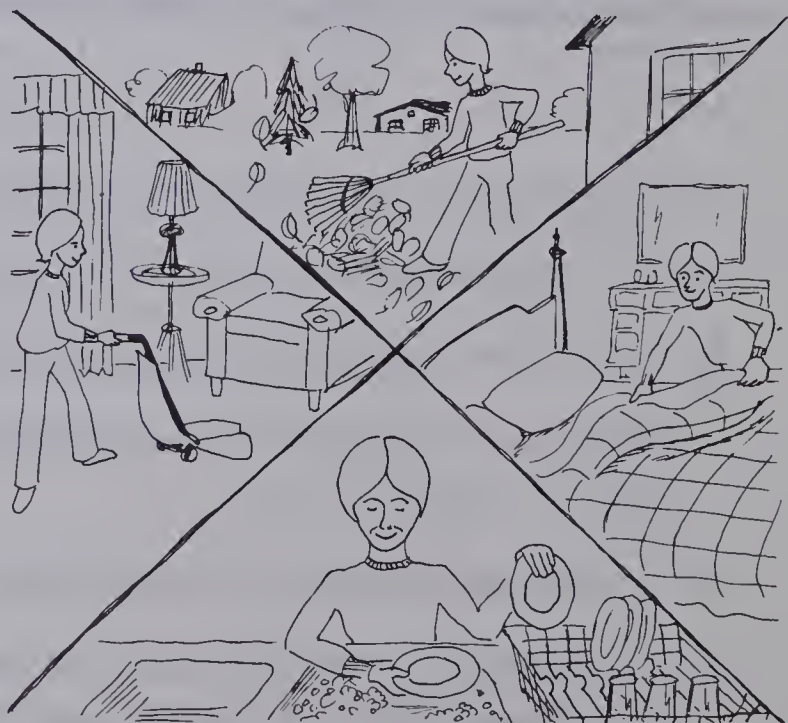
**Horn** 12:03 12:06 12:09 12:12 12:15 12:18 12:21

**Rooster** 12:04 12:08 12:12 12:16 12:20 12:24 12:28

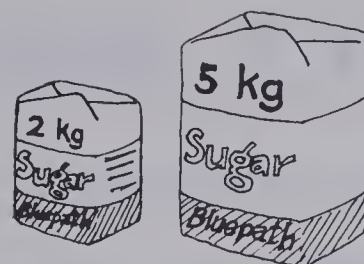
At 12:12, all three will sound off again.

Make a list to help you solve the problem.

1. Ed jogs every 3rd day, Ned jogs every 4th day, and Fred jogs every 6th day. If they all jogged today, when will they all jog on the same day again?
2. Tony lined up his toy soldiers by 6s and there were none left over. He lined them up again by 8s and there were none left over. He tried to line them up again by 10s, but there were 2 left over. What is the smallest number of toy soldiers which Tony could have?
3. Rosie promised to do chores for 2 weeks. Her mother offered to pay her 1¢ the first day, 2¢ the second day, 4¢ the third day, and double the amount of the preceding day for 2 weeks. How much money would Rosie make?
4. Rosie's father offered her \$1.00 the first day, \$2.00 the second day, \$3.00 the third day, and one more dollar than the previous day for 2 weeks. Is Rosie's father's offer better?



5. How many ways could you obtain 40 kg of sugar using only 2 kg or 5 kg bags?



6. How many different pairs of numbers have a sum of 100 and a digit sum of 19?

*Hint:*  $85 + 15 = 100$        $(8 + 5) + (1 + 5) = 19$

7. How many whole numbers between 1 and 1000 are evenly divisible by 2, 3, and 5?

*Hint:*  $60 \div 2 = 30$        $60 \div 3 = 20$        $60 \div 5 = 12$

8. How many times would the digit, 2, be written if you wrote down all the whole numbers from 1 to 100?

9. Mr. Francona wants to buy 30 L of milk. Some of the milk is in 3 L bags, the rest in 2 L cartons. How many ways could he purchase the milk?

10. The Downsview Diner has three kinds of burgers: taco burger, pizza burger, and limburger; two kinds of potatoes; fries or hash browns; and four different drinks: chocolate, cola, orange, or tea. If you order one burger, one kind of potato, and one drink, how many different combinations are possible?



# UNIT 9 Ratio, Proportion, and Percent

Ratios and proportions can help you solve problems.

## Problem:

For a barbecue party, Mrs. Tully estimated that 2 chickens would serve 5 people. How many chickens will Mrs. Tully need to serve 40 people?

## Solution:

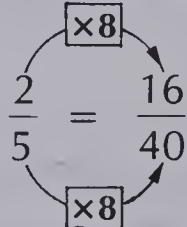
*One method*

Make a table. The numbers of chicken and people increase proportionately.

Chickens needed	2	4	8	16
Number of people	5	10	20	40

*Another method*

Write a proportion showing the relationship of chickens to people.

$$\frac{\text{chickens}}{\text{people}} \quad \frac{2}{5} = \frac{N}{40}$$


Mrs. Tully needs 16 chickens for 40 people.

Make a table or write a proportion to solve the problem.

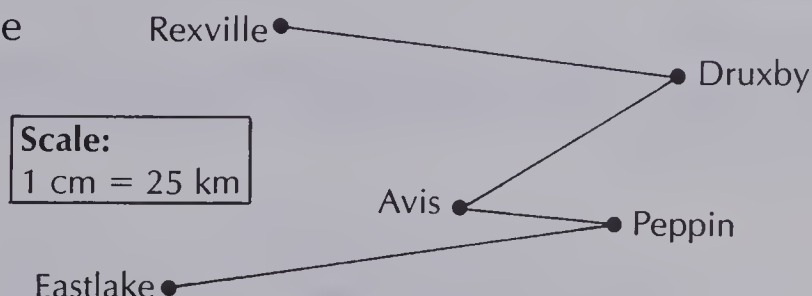
1. Lynn had 3 out of the first 5 problems on a math test solved correctly. If she keeps up the same rate of success for the entire test, how many correct answers will she have out of 30 problems?
2. When Drew plays golf, he loses a golf tee at every one of the 18 holes. If golf tees cost 2 for 15¢, what do tees cost Drew when he completes 18 holes of golf?
3. Cat food was on special at 2 cans for 59¢. Bruce stocked up with 32 cans. What was the cost?



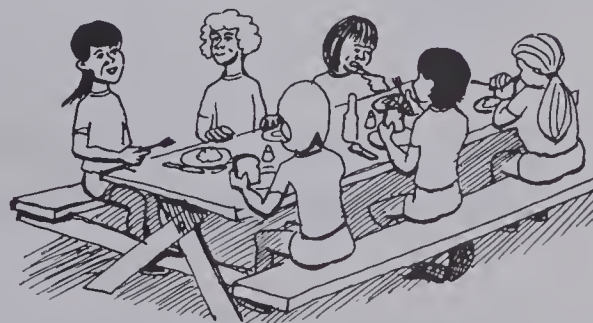
4. A man and a wife are walking together. The man takes two steps for every three steps taken by his wife. How many steps will be taken by the wife if the man takes 50 steps?
5. Ray did 400 sit-ups in 8 min. What was his rate of sit-ups per minute?

6. What is the actual distance between:

- a. Rexville and Peppin?
- b. Avis and Eastlake?
- c. Rexville and Eastlake?



7. Lois estimates that 2 large pizzas will serve 10 people and that 5 small pizzas will also serve 10 people. How many large pizzas will serve 40 people?
8. In baseball, an Earned Run Average (ERA) is the average number of runs allowed by a pitcher per 9 inning game. Hubert Leonard of the Boston Red Sox established the record low ERA of 1.00 runs per game in 1914. Leonard pitched a total of 225 innings that season. How many runs did he allow that year?
9. At Rhonda's birthday party, 14 L of pop were drunk. If Rhonda allowed 2 L for every 5 persons, how many people were at her party?
10. At Camp Lakeshore, 6 children eat at one lunch table. If there are 90 children at the camp, how many tables are needed?



11. A professional photographer does not use 2 out of every 3 of the pictures he takes. If he throws out 48 pictures, how many has he taken?

## Proportions can help you solve percent problems.

### Problem:

The marketers of *Brite* toothpaste claim that 3 out of 5 people use their product. What percent of people is that?

### Solution:

*One method*

Make a table. Increase the ratio, 3 to 5, proportionately until the number *per 100* is reached.

People using <i>Brite</i>	3	6	60
Total Number of people	5	10	100

*Another method*


Write a proportion showing the ratio, 3 to 5, as equal to a number *per 100*.

$$\frac{3}{5} = \frac{N}{100}$$
$$\frac{3}{5} = \frac{60}{100}$$

The marketers claim that 60 out of 100, or 60%, of the people use *Brite*.

Solve the problem using a table or a proportion.

1. In a survey, 7 out of 20 people said they disliked television football. If this survey was accurate, what percent of people dislike television football?
2. Sharon is reading a 300-page book. She has already read 180 pages. What percent of the book has she read?
3. In a basketball shooting match, Trish made 13 baskets out of 25 shots. What was her shooting percentage?

4. Beryl wants to buy a new bike which costs \$150.00. There is a tax of 6% on the selling price. What is the amount of tax?
5. Joanne's mother sold a house for her client for \$80 000.00. She received a commission of 5% of the selling price. How much did Joanne's mother earn on the sale?
6. A television set with an original price of \$600.00 was marked down at a 20% discount. How much less will be paid by the buyer at the sale price?
7. A 500 g jar of strawberry jam is 18% sugar. How many grams of sugar are in the jam?
- 
8. Canada Savings Bonds were being sold with an interest rate of 19%. If Mr. Bixby bought \$5000.00 worth of bonds, how much interest will he earn?
9. During a long drought, the amount of water in a city reservoir fell by 24%. If the reservoir contained 12 000 000 kL of water before the drought, how much water was left?
10. At a university, the tuition cost last year was \$1200.00. This year, the cost increased by 20%. What is the tuition cost this year?
11. Janet had a score of 85% on a social studies test. If the test had 20 questions, how many of her answers were incorrect?
12. A \$200 coat was sold for 30% less at a spring sale. What was the amount of discount on the coat?

# UNIT 10    Multi-Step Problems

The solution of a problem often requires more than one step or operation.

**Problem:**

In a peach orchard, there are 42 rows of peach trees with 31 peach trees in each row. If each peach tree produces about 80 kg of peaches, how many kilograms of peaches should be harvested?

**Solution:**

*Step 1*

*Multiply* to find the total number of peach trees in the orchard.

$$42 \times 31 = 1302$$

*Step 2*

*Multiply* to find the number of kilograms of peaches to be harvested.

$$1302 \times 80 = 104\,160$$

The peach harvest is  $(42 \times 31) \times 80$  or 104 160 kg.

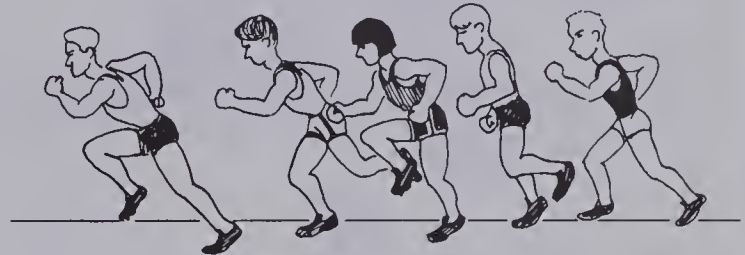
Solve.

1. Suppose that the peaches from the problem above can be sold for \$1.35/kg. If the total expenses for growing and marketing the peaches are \$67 500.00, what will be the profit if all the peaches are sold?
2. The students at Pinetree School are having a picnic at Crystal Lake. There will be 339 students and 13 teachers going to the picnic. Buses to carry all students and teachers can each take 44 people. How many buses will be needed?
3. A driver wishes to find how far he can go on a litre of gas. At 43 175 km on his odometer, he fills his tank with gas. At 43 604 km, he fills his tank again. It takes 32 L to fill the tank. How many kilometres does he get per litre of gas?



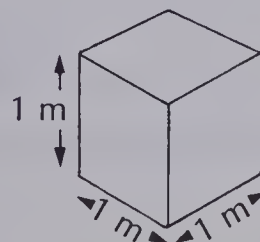
4. It has been estimated that on the average every Canadian uses about 8000 L of water per day counting industrial use. If there are about 25 million Canadians, about how many kilolitres of water are used in Canada in a year?
5. A teacher had to read 28 project reports by her students. In the first hour, she was able to read 5 of the reports. About how long will it take her to read all the reports?

6. The world's fastest humans can run 100 m in 10 s. If that speed could be maintained for 1 h, how many kilometres would they go?



7. On five successive days, the snowfall was recorded as 2.1 cm, 1.4 cm, 0.8 cm, 2.3 cm, and 3.4 cm. What was the average snowfall over the five-day period?
8. An apple has a mass of about 100 g. An orange has a mass of about 150 g. Which has the greater mass, a box of 96 oranges or a box of 140 apples?
9. Suppose an elevator has a load limit of 1000 kg and can thereby carry about 25 children. If an average child has a mass of 40 kg and an average adult has a mass of 70 kg, about how many more children than adults can the elevator carry?
10. Three partners bought a piece of land for \$21 000 and sold it for \$36 000. How much profit did each partner make?

11. How many square centimetres would cover the entire surface of a cubic metre?



**Problem:**

In professional hockey, a team gets 2 points for a win and 1 point for a tie. After 40 games, the Montreal Canadians had won 21 games and tied 7 while the Boston Bruins had won 23 games and tied 4. Which team was in first place at the time if no other teams had better records?

**Solution:**

*Step 1*

*Multiply and add to find the total points for Montreal.*

$$(21 \times 2) + 7 = 49$$

*Step 2*

*Multiply and add to find the total points for Boston.*

$$(23 \times 2) + 4 = 50$$

*Step 3*

*Compare:  $49 < 50$ .*

The Boston Bruins were in first place by 1 point.

Solve.

1. In professional soccer, a team gets 6 points for a regular victory unless they win in a shootout. A shootout victory counts for 4 points. In addition, a team gets a bonus point for every goal scored up to a maximum of 3 goals per game.

At one time during the season, the Vancouver Whitecaps had 10 regular victories and 2 shootout victories. The Seattle Sounders had 9 regular victories and 1 shootout victory. In addition, the Whitecaps had 29 bonus points, and the Sounders had 34 bonus points. Which team was ahead and by how much?

2. A Boeing 707 can carry 181 passengers; a Boeing 747 can carry 550; a McDonnell Douglas DC-10, 380; and a Lockheed L1011, 400. A 707 takes off at full capacity. Each of the other planes follow immediately with only half the passenger capacity. How many passengers are on the 4 planes?

3. Mrs. Folsom wants to rent a car for a business trip to Saskatoon. The Chip-Drive Company rents its cars at \$19.95/d plus 10¢/km for every kilometre driven over 100 km. The Clark-Car Company rents its cars for \$29.95/d with no extra charges. Mrs. Folsom estimates that her trip will last 3 days and she will drive 150 km. Which company offers the cheaper car rental for her?

4. Len wants to go through the tunnel with his flat-bed truck. He knows that the bed of the truck is 1.5 m from the ground and that his 30 cm high cartons are in stacks of 10 on the truck. Can he make it through the tunnel?



5. Shane can type 40 words/min. An experienced secretary can type 75 words/min. How much longer will it take Shane to type out a 3000 word essay than the secretary?
6. Early in the season, the Toronto Blue Jays had won 15 of their 25 games. In their next 25 games, the Blue Jays managed to win only 11 games. What was their winning percentage after 50 games?
7. Mr. Blanchard is paid \$12/h plus overtime. For all hours worked over 40 in a week, he gets paid  $1\frac{1}{2}$  times the regular hourly rate. One week, Mr. Blanchard worked the following hours:

Day	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Hours worked	8.5	8	9	9.5	8	6

How much did Mr. Blanchard earn that week?

# UNIT 11 Making a Simpler Problem

Rounding off numbers and discarding extra facts help to make difficult-looking problems simpler.

## Problem:

On a certain day, the Canadian dollar is worth 0.4529 British pounds, 0.7865 American dollars, 5.376 French francs, and 1.938 German marks. How many more francs than marks would you receive in exchange for 100 Canadian dollars?

## Solution:

*Make a simpler problem.*

- (1) Discard extra facts about British pounds and American dollars.
- (2) Round 5.376 francs to 5 francs and 1.938 marks to 2 marks.
- (3) Solve the simpler problem.

$$\begin{aligned} 100 \text{ Canadian dollars is } & \leftarrow 100 \times 5 = 500 \\ & \leftarrow 100 \times 2 = 200 \end{aligned}$$

about 500 francs.

about 200 marks.

*Now solve the original problem.*

$$\begin{aligned} 100 \text{ Canadian dollars is } & \leftarrow 100 \times 5.376 = 537.6 \text{ francs.} \\ & \leftarrow 100 \times 1.938 = 193.8 \text{ marks.} \end{aligned}$$

You would receive  $537.6 - 193.8$ , or 343.8 more francs.

Simplify the problem before solving it.

1. If one French franc is worth 0.186 Canadian dollars, which is the better buy:
  - a. 1 L of gas in Canada at 44.9¢/L, or
  - b. 1 L of gas in France at 3.92 francs/L?





2. Some world records for track events are listed below.

<i>Event</i>	<i>Record Holder</i>	<i>Time</i>
200 m	Pietro Mennea (Italy)	19.72 s
800 m	Sebastian Coe (Britain)	1 min 41.72 s
1500 m	Steve Ovett (Britain)	3 min 31.36 s

If a runner could maintain Pietro Mennea's speed for 1500 m, by how much would the 1500 m record be broken?

3. Mercury is the closest planet to the Sun and it takes only 87.97 days for Mercury to revolve around the sun. Pluto is farthest from the sun and takes 247.7 years to revolve around the sun. Jupiter is the largest planet and takes 11.86 years to revolve around the sun. About how many times does Mercury revolve around the sun while Pluto is revolving around the sun just once?
4. Gordie Howe was a 52-year-old grandfather when he was selected as an NHL All-star for a record 22nd time. He has held records for most major league hockey games played with 2421 games, most years in the NHL with 26, most career goals with 1071, most career assists with 1518, most total points with 2589, and additional playoff-game records. In his long career, about how many points did Gordie Howe have per game?
5. The largest restaurant chain in the world is McDonald's Corporation. By 1981, there were 6263 McDonald's restaurants in 26 countries. Sales in 1980 totalled \$6 226 000 000. If the average customer spent \$2.10, about how many customers did the McDonald's chain of restaurants have in 1980?



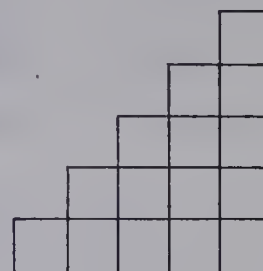
Problems can be made simpler by splitting them into smaller, sub-problems.

**Problem:**

How many squares are contained in the staircase pattern?

**Solution:**

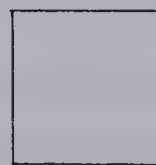
Determine the different kinds of squares.



1 by 1



2 by 2



3 by 3

Count the number of each kind of square.

(1) 1 by 1

Counting by layers, there are  $1 + 2 + 3 + 4 + 5$  or 15 squares.

(2) 2 by 2

These squares overlap.

The dots show the centres of these squares.

There are  $1 + 2 + 3$  or 6 squares.

(3) 3 by 3

There is only one of these squares.



The total number of squares in the pattern is  $15 + 6 + 1 = 22$ .

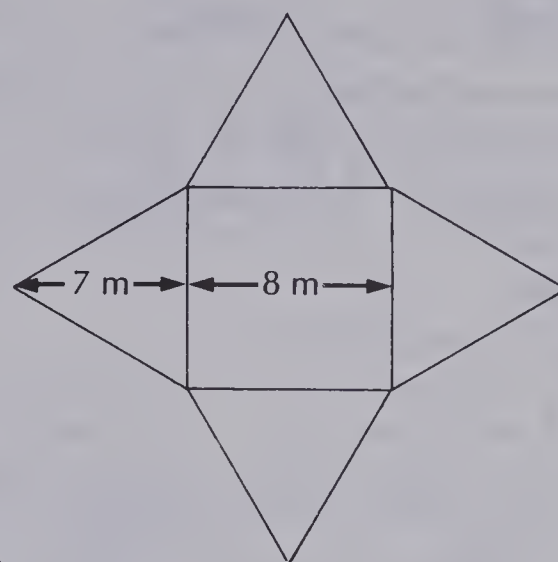
Solve.

- How many squares are there in the checkerboard figure?

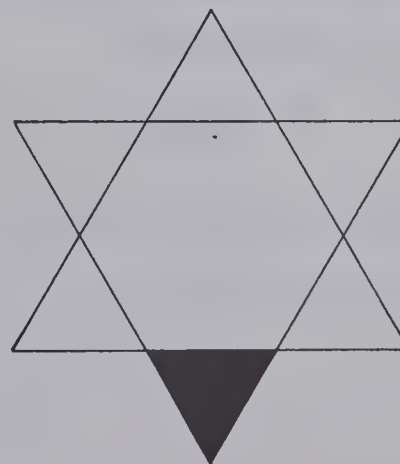


2. Babe Ruth holds the record for most total bases in a season. A single counts for 1 base, a double counts for 2 bases, a triple counts for 3 bases, and a homer counts for 4 bases. Ruth had 85 singles, 44 doubles, 16 triples, and 59 homers. How many total bases did he get?

3. A garden is in the shape of the figure at the right. It consists of a square and 4 congruent triangles. What is the area of the garden?



4. The perimeter of a picture frame is 140 cm. The length is 40 cm. What is the area enclosed by the frame?
5. On a math test, Karen got 7 of the first 10 problems right. There were 20 problems on the test and her total score was 80%. How many problems did she get right on the second half of the test?
6. The numerals 333, 7777, and 88 all contain repeated, single digits. How many numerals between 11 and 999 999 contain repeated, single digits?
7. Mr. McNair left at 9:00 in the morning. He drove 280 km at 80 km/h. He stopped for lunch for 45 min. Then he drove 270 km more at 90 km/h and arrived at his destination. At what time did he arrive?
8. The 6-pointed star shown at the right is formed by laying two congruent triangles upon each other to form 6 small triangles and a hexagon. If the shaded triangle has an area of  $4 \text{ cm}^2$ , what is the area of the entire star?



# UNIT 12 Reasonable Answers

Use common sense to decide if an answer is reasonable.

## Problem:

In the 1961-62 basketball season, Wilt Chamberlain established a record for professional basketball by scoring 4029 points in 80 games. What was Wilt Chamberlain's average per game?

- a. 5.4 points      b. 50.4 points      c. 504 points

## Solution:

Common sense tells you:

5.4 points are not high enough to be a record.

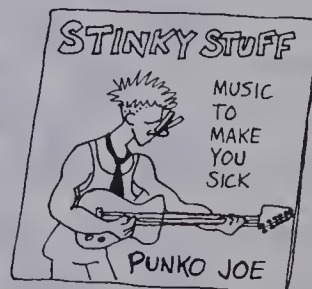
504 points are too many points for one game.

50.4 points are a reasonable number of points for a game.

Wilt Chamberlain's average per game was 50.4 points.

Choose a reasonable answer.

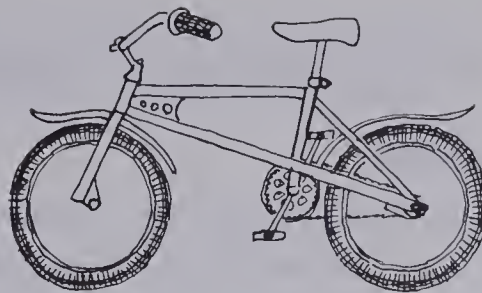
1. A hockey team averaged 4.2 goals per game during a season of 80 games. About how many goals did the team score that season?  
a. 34      b. 340      c. 3400
2. A rock album went on sale for \$6.95. In one day, a record shop sold 116 of the albums. How much did the record shop receive in sales for that album in the one day?  
a. \$80.62      b. \$806.20      c. \$8062.00





3. The regular price on a bicycle was \$160.00. The bike went on sale at a discount of 20%. What was the sale price of the bike?

a. \$32.00      b. \$128.00      c. \$192.00



4. For a backyard barbecue, Linda expects about 40 people. She wants to have enough hamburger meat so that each person will have 2 hamburgers. She has found that 1 hamburger takes about 100 g. How much hamburger meat should she buy?

a. 8 kg      b. 80 kg      c. 800 g

5. A border for a flower garden is 5 m long. Marigolds are planted on the border 25 cm apart. About how many marigolds make up the border?

a. 20      b. 50      c. 200

6. Mr. Tubbs took a trip by car and filled his tank 4 times. The fill-ups took 48.9 L, 51.8 L, 53.6 L, and 49.8 L of gas. The average price per litre was 44.9¢. About how much did Mr. Tubbs spend for gas?

a. \$9.00      b. \$90.00      c. \$900.00

7. The town of White Rock, B.C. is only about 30 km south of Vancouver, but White Rock averages 154 more hours of sunshine per year than Vancouver. About how much more sunshine per day does White Rock get than Vancouver?

a. 1.5 h      b. 2.5 h      c. 30 min

8. Tess brushes her teeth twice a day. She has a tube of toothpaste that contains 150 mL. If Tess uses about 1.5 mL each time she brushes, about how many weeks will her tube of toothpaste last?

a. 7 weeks      b. 50 weeks      c. 100 weeks

Estimation helps you to decide if an answer obtained is reasonable.

**Problem:**

A swimming pool has a capacity of 198 kL. If the pool is filled at the rate of 96 L/min, how long will it take to fill the pool?

**Solution:**

*Estimate the answer.*

198 kL rounds to 200 kL or 200 000 L.

96 L/min rounds to 100 L/min.

$200\ 000 \div 100 = 2000$  min to fill the pool.

$2000 \div 60$  is about 33 h to fill the pool.

*Calculate the answer.*

$198\ 000 \div 96 = 2062.5$  min to fill the pool.

$2062.5 \div 60 = 34.37$  h to fill the pool.

The estimated answer of about 33 h tells us that the calculated answer is probably correct.

Estimate a reasonable answer. Then calculate the exact answer.

1. Last year Shannon earned \$546.00 by baby-sitting. What were her average weekly earnings from baby-sitting?
2. One day, the donut shop sold 108 dozen donuts at the rate of \$3.75 per dozen. How much money was taken in for the donuts?



3. At Cedarbush School, there are 784 students. About one fourth of the students watch TV more than 3 h/d. About how many students is that?

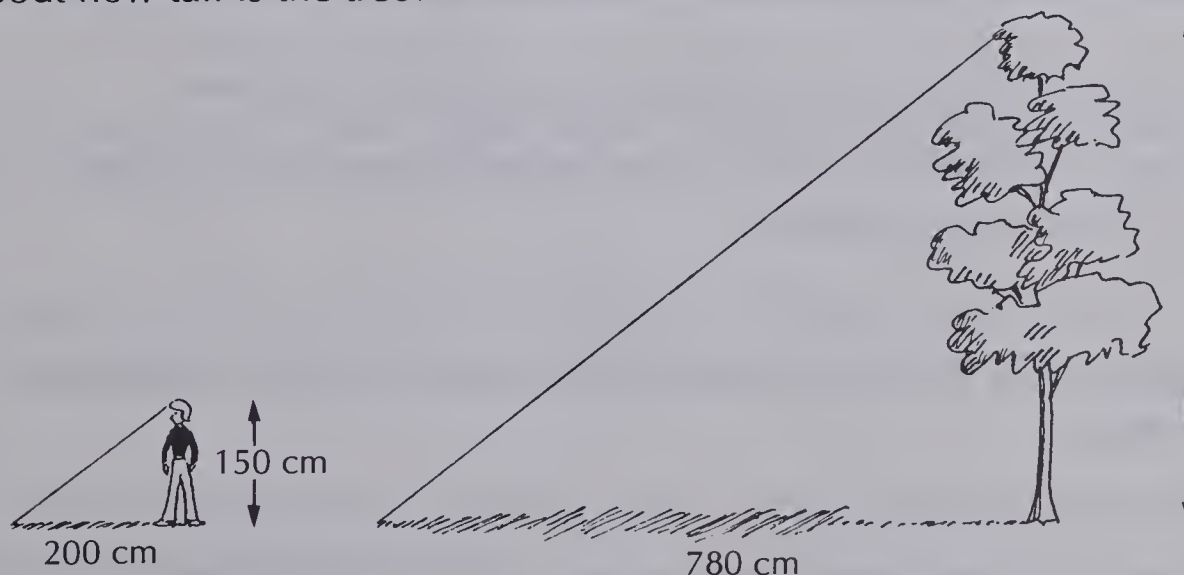
4. On a fishing trip, Josh caught a 7 kg and a 3 kg salmon. At the time, the supermarket price for salmon was \$5.85/kg. What was the supermarket value of the salmon caught by Josh?
5. A city census was taken and a count of 119 800 city residents was found. If 49% of the residents are males, how many males are in the city?
6. On a golf course, 5000 m<sup>2</sup> of turf are to be treated with a special weed and feed mixture. A 10 kg bag of the mixture will treat about 500 m<sup>2</sup> of turf. About how many bags of the mixture will it take to treat the turf?

7. Helga drinks 1 glass of milk daily.  
A glass holds about 300 mL.  
How many litres of milk does she drink in 1 year?



MARCH						
SUN	MON	TUE	WED	THU	FRI	SAT
			X	X		
X	7	8	9			
13	14	15	16			
20	21	22	23			
27	28	29	30			

8. Marg is 150 cm tall. At a certain time of day, her shadow length was 200 cm long. At that same time, a tree cast a shadow 780 cm long. About how tall is the tree?



9. At a showing of *Chariots of Fire*, there were 960 people. Prices for adults were \$4.50; for youths, \$3.50; and for senior citizens, \$2.50. If there was an equal number of adults, youths, and senior citizens at the movie, how much money was taken in from ticket sales?

# UNIT 13 Using Other Resources

Atlases, almanacs, newspapers, or encyclopedias contain the facts needed to solve some problems.

## Problem:

Which is greater, the combined population of Canada's two largest provinces, or the population of all the rest of Canada?

## Solution:

Investigate and compare the populations:

Quebec	6 438 403	All of Canada	24 343 181
Ontario	+ 8 625 107	2 largest provinces	– 15 063 510
	<u>15 063 510</u>		<u>9 279 671</u>

$$15\,063\,510 > 9\,279\,671$$

The two most populated provinces have more people than all the other provinces and territories combined.

Use other resources to find the facts you need to solve the problem.

1. How long would it take a trout to swim the entire length of the Yukon River if it could swim 2 km/h?
2. How much farther is it from Toronto to Vancouver than from Toronto to Charlottetown?
3. About how many cats would have the same mass as an elephant?
4. What animal is the largest in the world? What is its mass? What is its main food?



5. In the 1981-82 hockey season, Wayne Gretzky broke the record for most goals scored in a season and most points scored in a season. Who had the record previously and by how much did Gretzky break the record?
6. How many kilometres is it to drive from your town to the most distant point (that can be reached by road) in your province?
7. How many kinds of postage stamps did Canada issue in 1980? Compare this to the number of stamps issued in 1970 and 1960.



8. About how many telephone numbers are there in your local telephone book? How does the number of telephones compare with the population of the telephone district?
9. Mercury is a very heavy liquid metal. How much more is the mass of a litre of mercury than a litre of water?
10. How many years after the Confederation of Canada was formed was the last spike of the Canadian Pacific Railway nailed?
11. How many kilometres of seacoast does Canada have? How does this compare to the United States?
12. What is the total driving distance from Winnipeg to Saskatoon, Calgary, Edmonton, and Vancouver?

A survey or other activity can provide the information necessary to solve a problem.

**Problem:**

If the entire class lined up with arms extended and finger tips touching, how long would the line be?

**Solution:**

*One way*



Form the line described.  
Measure the length.

*Another way*



Select an average-sized student. Measure his or her arm span. Multiply the arm span by the number of students in the class.

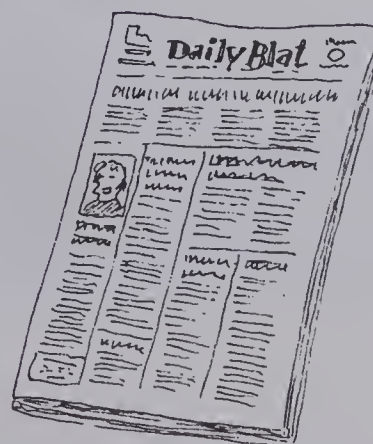
1. How many students with arms extended and touching fingertips would it take to form a continuous line from Calgary to Winnipeg?
2. How many books are in the school library?  
How many of these books are on the reference shelves?
3. About how many words are there in one of your textbooks?
4. If basketballs could be piled one on top of the other, how many basketballs would it take to reach to the top of a basketball net?



5. Measure a large Canadian postage stamp such as the \$1.00 stamp and also a small Canadian stamp such as the Maple Leaf stamp. If the bulletin board were covered completely with Maple Leaf stamps, how many more of those stamps would be used than if the \$1.00 stamps completely covered the bulletin board?
6. Find out how long your pace is. How many paces would it take to cover the distance from one end of a school hallway to the other?
7. How tall is the school flagpole or a tall tree on the school grounds?
8. About what fraction of the number of pages in your dictionary have words beginning with the letter "S"?
9. Make surveys to find out the following:
  - a. Most popular television program
  - b. Favourite spectator sport
  - c. Favourite rock star
  - d. Favourite dessert
  - e. Most disliked food

Record the results of your survey. Display the results on a graph or chart.

10. How many kilograms of hot dogs would it take to supply lunch for every person in the school?
11. About how many words appear on the front page of your daily newspaper?



# UNIT 14    Review Problems

- 1. If the 52 cards in a deck are arranged in a line with each card touching the edge of the next card, how long will the line be?
- 2. Della worked the first 12 problems of a 40-problem test in 20 minutes. The time allowance for the test was one hour. If Della continued the test at the same rate, how many problems will she have worked when time is up?
- 3. The ad shown below appeared in a newspaper. Mr. Becker has two cars and he had engine tune-ups done on both of them. His bill for the two tune-ups was *about* \$112.00. What is the number of cylinders on each of Mr. Becker’s two cars?

12-MONTH TUNE-UP

46<sup>95</sup>  
4 cyl.

56<sup>95</sup>  
6 cyl.

64<sup>95</sup>  
8 cyl.

Includes 12-Month Service Warranty.

- 4. Below are the parking rates for 2 garages:

U-PARK	\$0.50 for the first hour \$0.30 for each additional hour
CITY PARK	\$1.00 for the first hour \$0.20 for each additional hour

For what number of hours will the parking costs be the same for the two garages?

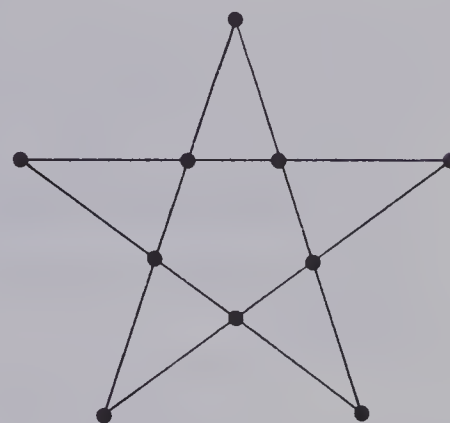


5. The table gives the approximate distances to the sun in kilometres from several planets. If Mercury is represented on a bar graph by a bar 4 cm long, how long a bar should represent the Earth?

Mercury	60 000 000
Venus	110 000 000
Earth	150 000 000
Mars	220 000 000

6. A palindrome is a number which is read from right to left exactly as it is from left to right. Examples are 575, 8338, 35 253, and 7777. How many numbers between 11 and 999 are palindromes?

7. It is possible to have 10 plants arranged so that there are 5 rows with 4 plants in each row. This can be done by arranging the plants in the pattern of a 5-pointed star as shown. Draw a figure which shows how you could have 12 plants with 6 rows and 4 plants in each row.

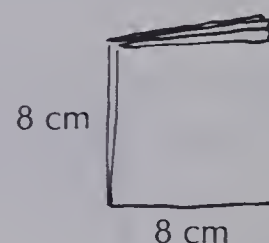
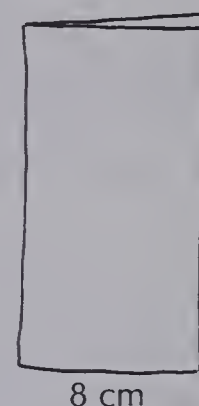
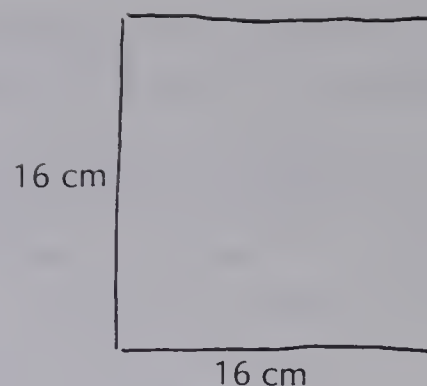


8. At a track meet, Mountainview School scored twice as many points as Clearbrook School. Shadylane School scored three times as many points as Mountainview. Altogether there were 198 points scored in the track meet. What were the point totals for each school?
9. There are 2 routes from the base of Mt. Cupcake to the top. One route is a steep climb of 1800 m. The other route is a hiking distance of 6600 m. Luke estimates that he can climb the steep ascent at the rate of 500 m/h. Melanie estimates that she can walk the hiking route at the rate of 2 km/h. If their estimates are accurate, who would reach the mountain top first, and how much more quickly?

10. Start with a paper square which is 16 cm on each side. Find its area. Fold the square in half and find the area of the rectangle which is formed.

Next, fold that rectangle in half and find the area of the square which is formed. Continue folding into rectangles or squares six times. What is the shape of the figure formed after the sixth folding?

What is the area of that sixth figure?



11. Find the perimeter of each of the above squares and rectangles before it is folded into a smaller shape. Make a list of the perimeters which are formed. What is the perimeter of the figure after the sixth folding? the eighth folding?
12. Hank does engine tune-ups in his father's garage. In one week, he replaced all the spark plugs on 17 cars. The cars had either 4 or 6 spark plugs each. The total number of spark plugs replaced by Hank was 90. How many cars required 4 spark plugs each?
13. How much does a family save if it buys milk in 3 L bags instead of 2 L cartons and uses 24 L of milk per week?
14. The longest postage stamp ever issued is the 1913 Express Delivery stamp of China which measures 24.8 cm long and 7.0 cm wide. The smallest stamp ever issued is the 1 peso of the Columbian state of Bolivar issued in 1863-1866. This stamp is 0.94 cm long and 0.78 cm wide. About how many times would the length of the smallest stamp fit into the length of the largest stamp?

15. A popular magazine sells on the newsstand for \$2.00. To attract mail subscriptions, they offer these choices:

**(The longer your subscription, the more you save!)**

☐ 9 months, \$12   ☐ 12 months, \$16   ☐ 18 months, \$23   ☐ 24 months, \$28

\_\_\_\_\_  
Name

\_\_\_\_\_  
Address

\_\_\_\_\_  
City

\_\_\_\_\_  
Province

\_\_\_\_\_  
Postal Code

☐ This is a new subscription.   ☐ This is a renewal.

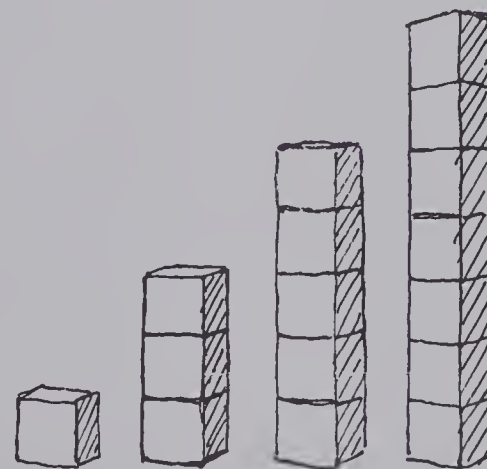
☐ \$\_\_\_\_\_ enclosed.   ☐ Bill me later.

**Save up to \$35. off the cover price!**

What is the cost per magazine for each subscription time period?  
Can you save \$35 off the cover price?

16. Mr. Kimble, a grocer, checked his supply of milk and counted 80 containers. Some were 2 L cartons and others were 3 L bags. Altogether there was a total of 220 L of milk. How many of the containers were 3 L bags?

17. Stack blocks with 1 block in the first column, 3 blocks in the second column, 5 blocks in the third column, and so on for 8 columns. What is the fewest number of blocks that you could move to make all 8 columns have equal height?



18. Todd and Rod decided to hike to a distant waterfall. Todd took the long way. He went north for 4 km, east for 6 km, south for 2 km, and arrived at the waterfall. Rod took the short way. He went east for 4 km, north for 2 km, east for a certain distance, and then reached the waterfall. How much farther did Todd have to hike than Rod?











## DATE DUE SLIP

[illegible]



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